Printed Page:- 04 **Subject Code:- ACSBS0404**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: IV - THEORY EXAMINATION (2023 - 2024)

Subject: Database Management Systems

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* ***three Sections -A, B, & C.*** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION-A 20

1. Attempt all parts:-

1-a. The Rectangles in E-R diagram represents (CO1) 1

(a) Entity set

(b) Relationship set

(c) Attributes of a relationship set

(d) Primary key

1-b. Recall the expansion of the acronym "DBMS" .(CO1) 1

(a) Data of Binary Management System

(b) Database Management System

(c) Database Management Service

(d) Data Backup Management System

1-c. If a table has been normalized so that all determinants are candidate keys, then that table is in:(CO2) 1

(a) BCNF

(b) Second

(c) Third

(d) First

1-d. Consider a relation R(A, B, C, D) with the following functional dependencies: A -> (B, C, D), (A, D) -> (B, C) and (C, D) -> (A, B). Identify the candidate key(s). (CO2) 1

(a) {A}
(b) {A}, {C, D}
(c) {A}, {C, D}, {A, D}
(d) {C, D}

1-e. Which is not a category of SQL command.(CO3) 1

(a) TCL
(b) SCL
(c) DCL
(d) DDL

1-f. Select the Aggregate function(s) among the following. (CO3) 1

(a) AVG()
(b) FIRST()
(c) LAST()
(d) All of the above

1-g. In concurrency control, what does the term "serializability" refer. (CO4) 1

(a) The ability to perform transactions in parallel without interfering with each other
(b) The property of a schedule that ensures it produces the same results as if transactions were executed serially
(c) The process of recovering data after a system failure
(d) The mechanism used to assign unique identifiers to transactions

1-h. Either 100 % or 0 % of execution is ensure by which property. (CO4) 1

(a) Atomicity
(b) Consistency
(c) Two-phase locking
(d) Timestamp ordering protocol

1-i. In a relational database a referential integrity constraint can be specified with the help of (CO5) 1

(a) primary key
(b) foreign key
(c) secondary key
(d) none of the above

1-j. The active data werehouse includes (CO5) 1

(a) Real time update
(b) At leat one data mart
(c) Data that can extracted from internal and external sourses
(d) All of the above

2. Attempt all parts:-

2.a. Show a real time examples illustrating both one-to-one and one-to-many 2

relationships in databases.(CO1)

2.b.	Describe the difference between functional dependency and multi-valued dependency in the context of database normalization. (CO2)	2
2.c.	Describe the purpose of the WHERE clause in SQL queries.(CO3)	2
2.d.	Explain the concept of serial and non-serial schedules in database transaction processing.(CO4)	2
2.e.	Explain the Distributed Databases with real time example. (CO5)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	Give example of Simple, Composite, Single –valued and Multi-valued attributes of an entity. (CO1)	6
3-b.	Compare and contrast between File System and DBMS.(CO1)	6
3-c.	Given a relation schema R(A, B, C, D) with functional dependencies A → B, B → C, and C → D, determine all possible superkeys for the relation schema R. Then, identify the candidate keys from the set of superkeys.(CO2)	6
3-d.	Consider a relation schema R(ABCDE) with the following set of functional dependencies: A → B B → C C → D D → E Determine the candidate keys for the relation schema R. (CO2)	6
3.e.	Explain Trigger with insertion , deletion and updation tasks via sql query. (CO3)	6
3.f.	Explain the differences between conflict serializable schedules and view serializable schedules. Provide examples to illustrate these differences. (CO4)	6
3.g.	Describe SQL Injection. (CO5)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Explain the Object-Oriented Model in database management systems. Discuss its main characteristics such as encapsulation, inheritance, and polymorphism. (CO1)	10
4-b.	Construct an Entity-Relationship (ER) diagram for a college system that includes information about students, courses, instructors, and registrations. Additionally, include entities and relationships specific to the Computer Science and Business Studies (CSBS) department within the college. Ensure that your diagram accurately represents the relationships between entities, attributes, multivalued attribute, derived attribute and weak entity. (CO1)	10

5. Answer any one of the following:-

5-a.	Explain the concept of database normalization and discuss each of the	10

normalization forms (1NF, 2NF, 3NF, BCNF) in detail. Describe the conditions that must be satisfied for a relation schema to be in each normalization form and provide examples to illustrate each form. Finally, discuss the importance of normalization in database design and the benefits it offers in terms of data integrity, efficiency, and maintainability. (CO2)

5-b. Explain the concepts of Fourth Normal Form (4NF) and Fifth Normal Form (5NF) in the context of database normalization. Discuss the conditions that must be satisfied for a relation schema to be in each normalization form and provide examples to illustrate each form. Finally, discuss the importance of 4NF and 5NF in database design, highlighting their significance in eliminating certain types of data redundancies and dependencies. (CO2) 10

6. Answer any <u>one</u> of the following:-

6-a. Write characteristics, advantages and disadvantages of SQL. Write sql commands for the following operations- 10
a. Create table name employee with attributes (emp_id, emp_name, salary, phone no).
b. Insert atleast five rows in above employee table.
c. Write query to find sum, avg of salary.
d. Find min and max salary of employee. (CO3)

6-b. Discuss the join operator in relational algebra and its significance in combining data from multiple relations based on common attributes. Explore different types of joins such as inner join, outer join, and cross join. Provide examples to demonstrate each type of join operation. (CO3) 10

7. Answer any <u>one</u> of the following:-

7-a. Consider the following schedule of transactions: T1: R(A), W(A), R(B), W(B) T2: W(B), R(B), W(A), R(A) Determine if the given schedule is conflict serializable using the precedence graph method. Show the construction of the precedence graph and explain your reasoning. 10
If the schedule is not conflict serializable, provide a serializable equivalent schedule by reordering the transactions. Justify your answer. (CO4)

7-b. Discuss the role of timestamp-based protocols in ensuring serializability of transactions in database systems. Explain how timestamp ordering and concurrency control mechanisms work together to maintain data consistency and isolation. (CO4) 10

8. Answer any <u>one</u> of the following:-

8-a. Explain Data Mining in details. How Data mining and data warehousing are different to each other. (CO5) 10

8-b. Describe in detail the principles of database security, including authentication, authorization, and access control mechanisms. Discuss the differences between Mandatory Access Control (MAC), and Role-Based Access Control (RBAC) models. (CO5) 10